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Stability of Temperament in South Korean Infants from 6 to 12 to 18 Months: Moderation by Age, Sex, and Birth Order

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Temperament in infancy is generally viewed as constitutionally based individual differences in emotional, motor, and attentional reactivity and self-regulation (Rothbart & Bates, 2006). Despite infants' rapid overall development in the first years of life (Bornstein, Arterberry, & Lamb, 2014), relative stability of infant temperament has been consistently reported (e.g., Bornstein et al., 2015; Rothbart, 1986). However, current theory suggests that systems that control/inhibit temperament emerge later in infancy, changing the expression and stability of temperament (Shiner et al., 2012). Moreover, stability is not static, but dynamic, and many factors are acknowledged to moderate stability, including the characteristic studied, developmental stage, and the temporal interval between assessments. In short, stability in development is contingent, not absolute, underscoring the need to study its sensitivity to moderators.

Is temperament stable in infants in non-Western cultures, and is it (equivalently) stable in younger and older infants, girls and boys, firstborns and laterborns? Characteristics of development that appear universal may be culturally specific and vice-versa (Bornstein et al., 1999). Cultural variation in the stability of infant temperament can be anticipated insofar as biological foundations of individual differences vary between groups (Way & Lieberman, 2010), and because temperament is open to experience, such as differences in “developmental niches” of infants (Super & Harkness, 1986). In addition, the majority of existing research on the stability of infant temperament has been carried out in Western

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cultures, despite considerable evidence of potential cultural influences on temperament development (Chen & Schmidt, 2015). Thus, further study of the robustness of the early stability of temperament, especially in non-Western settings like South Korea, is warranted.

The transition from infancy to early childhood represents a period of major developmental change and reorganization, thus it is possible that temperament is more stable within, rather than between these stages (Goldsmith et al., 1987). Studies of infant temperament that considered child sex as a moderator suggest generally similar stability in girls and boys (with some differentiation by dimension; Bornstein et al., 2015; Garcia Coll et al., 1992). At the same time, biological differences between infant girls and boys are compounded by differential treatment they receive from caregivers (Bornstein, 2013). Birth order has not been evaluated as widely, yet likely plays a role with respect to temperament stability. Parental treatment of first- and laterborns is often not consistent, and siblings' different experiences (their nonshared environments) in growing-up contribute to making them distinctive individuals (Plomin & Daniels, 1987; Stoolmiller, 1999; Turkheimer & Waldron, 2000). Nonetheless, Bornstein et al. (2015) reported no differences in stability of temperament in first- vs. secondborns over the first year of life.

Stability is a central feature of temperament; thus, we set out to revisit this critical element in a non-Western culture and to examine the moderating roles of infant age, sex, and birth order, on stability. The majority of available empirical evidence points to overall moderate stability of temperament attributes, so a priori we expected significant degrees of stability. At the same time, the limited literatures addressing potential moderators of stability suggests some residual variation in the extents to which different temperament traits may be stable. Our first goal was to explore the stability of factors and fine-grained temperament attributes across three time points in infancy in a South Korean sample, and our second goal was to evaluate potential moderation of this stability by child age, sex, and birth order.

Mothers of 315 infants provided temperament ratings when their infants were 6, 12, and/or 18 months of age. Overall, 28.17% of the data points were missing completely at random, MCAR; $\chi^2(346) = 284.753, p = .993$, and missing values were multiply imputed using SPSS 21's Markov Chain Monte Carlo (MCMC) method. Twenty imputed datasets were generated and stability coefficients were pooled across the datasets.

All children were term (M birth weight = 3370.25 g, $SD = 477.98$) and healthy at birth and at each wave; 156 (50%) were girls, and 159 (50%) boys; 159 were firstborns (50%), and 156 (50%) laterborns. All mothers and infants were South Korean, and mothers averaged 30.46 years of age ($SD = 3.54$). Twenty-six percent of mothers completed high school or less education, 25% completed a college degree, 41% completed a university degree, and 8% completed a graduate degree. Families came from the Seoul metropolitan area and were middle to upper socioeconomic status: monthly income ranged from < 1 million to > 5 million won, with 68.4% of the sample reporting incomes of 1-3 million won.

Mothers completed the Infant Behavior Questionnaire-Revised (IBQ-R; Gartstein & Rothbart, 2003), 191 items that compose 14 scales: Smiling and Laughter, Soothability, Duration of Orienting, Activity Level, Fear, High and Low Intensity Pleasure, Falling

Reactivity/Lowering Arousal, Cuddliness, Perceptual Sensitivity, Sadness, Approach, and Vocal Reactivity, computed as means of all relevant items. Following Gartstein and Rothbart (2003), we computed three higher-order scales reflecting surgency (mean of approach, vocal reactivity, high intensity pleasure, smiling and laughter, activity level, and perceptual sensitivity), negative affectivity (mean of sadness, distress to limitations, fear, and negatively loading falling reactivity), and orienting/regulation (mean of low intensity pleasure, cuddliness, duration of orienting, and soothability). Gartstein and Rothbart (2003) reported alpha coefficients ranging from .70 to .90 for 3- to 12-month-olds. This measure was translated into Korean by bilingual South Korean natives and back-translated into English by bilingual, bicultural U.S. residents to ensure cultural appropriateness and accurate translation (Peña, 2007).

The magnitudes of stability coefficients for all IBQ-R temperament scales (Table 1) were medium to large from 6 to 12 months and from 12 to 18 months and medium from 6 to 18 months. Even spacing of the three developmental waves enabled us to compare 6-month stability across two unique developmental periods (6-12 months and 12-18 months); however, no clear pattern of differential temporal stability emerged. Stability estimates for perceptual sensitivity and sadness were slightly stronger for 6-12 months, $z_s = 2.87$ and 1.96 , $ps < .05$, respectively, and the stabilities for approach and soothability were slightly stronger for 12-18 months, $z_s = -2.22$ and -2.44 , $ps < .05$. Girls' and boys' stability coefficients were similar (Table 2A), as were those for first- and laterborns, with some notable exceptions. Birth-order differences were observed for vocal reactivity first-born infants are more stable between 6-12, and 12-18 months (Table 2B). Negative affectivity overall and fear and falling reactivity at the fine-grained level were more stable for first-borns 6-12 months. First-borns also demonstrated greater stability of orienting/regulation 6-12 and 6-18 months, and cuddliness 6-18 months.

Overall, temperament in South Korean infants can be described as stable across age (with few instances of birth-order moderation), suggesting that stability is a central and robust aspect of temperament factors and scales in this culture. Results of this study contribute to the emerging literature addressing temperament development in non-Western (in this case South Korean) infants. Whereas Kim and Kwak (2007) focused on age-related changes in mean levels across fine-grained temperament attributes, our findings indicate stability of traits in the first 1½ years of life in terms of infants' rank order.

Stability of temperament in South Korean infants was roughly equivalent across two developmentally disparate periods (6 to 12 and 12 to 18 months), despite very different capabilities of infant functioning between those times (see also Bornstein et al., 2014). This pattern of findings is not consistent with a thesis that stability is more likely within than between periods of rapid developmental change (Goldsmith et al., 1987).

Similarities in stability coefficients for South Korean girls and boys were pervasive. These results are consistent with the generally similar stability of temperament in girls and boys (with some exceptions: Bornstein et al., 2015; Garcia Coll et al., 1992), in the only studies (to our knowledge), examining child sex as a moderator. However, any discrepancy, or instance of disagreement with respect to differences between girls' and boys' temperament

stability, could represent a cultural difference, wherein South Korean female and male infants demonstrate stability across different attributes than their U.S. counterparts. Thus, moderation of temperament stability by child sex may not be consistent, but rather context dependent, and this possibility should be considered further in future research. That said, methodological differences (i.e., different assessment timing and measurement approaches) with Garcia Coll et al. (1992) and Bornstein et al., (2015) make alternative explanations plausible.

In addition, firstborn South Korean infants may be more stable in some aspects of temperament, namely vocal reactivity, overall negative affectivity, fear, falling reactivity, regulatory capacity, and cuddliness. It may be that the child's position in the family influences parents' approach to interactions, and subsequently child temperament development, shaping stability of certain attributes. These effects should be examined further for Western cultures, as it is possible firstborn infants from such samples do not present with the same pattern of greater stability. Our results may reflect unique aspects of parent-child interaction dynamics with firstborn infants eliciting both higher levels of distress and regulation as well as greater vocal responsiveness, which may be culture-specific and should be examined more closely. Of course, the contribution of biological factors could be important as well (Way & Lieberman, 2010).

Although we examined several factors moderating stability of temperament, additional variables (e.g., maternal depression or child health problems) could be important. Birth-order was assessed in a between- not within-family design, which should be considered in future studies. As we relied exclusively mother-report of infant temperament, other measurement approaches should also be considered.

In conclusion, this study makes a unique contribution to the infant temperament literature by focusing on stability of infant temperament in a non-Western culture and closely examining multiple potential moderators at the same time. Although substantial stability emerged, there were also notable exceptions, with birth-order providing some moderating influence. This study does not directly address cross-cultural similarities or differences in the stability of temperament between infants from South Korea and a Western sample, but the stability results for South Korean infants largely parallel those for U.S. (Bornstein et al., 2015; Rothbart, 1986), Spanish (Carranza Carnicero et al., 2000), and Dutch (Sung et al., 2015) infants.

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- Examined stability of temperament across the first 18 months of life
- Considered infant age, gender, and birth-order as moderators, in a Korean sample
- Considerable stability of temperament attributes was observed overall
- Some moderation by gender and birth-order, and no evidence of systematic age-related differences

Table 1

Descriptive Statistics and Stability across Time for the IBQ-R Factors and Scales

	Descriptive Statistics						Stability					
	6 month		12 month		18 month		6 - 12 month		12 - 18 month		6 - 18 month	
	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>	<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>	<i>r</i>
Surgency	4.71	.04	4.83	.03	4.98	.03	.62***	.58***	.44***			
Approach	5.11	.06	5.42	.04	5.52	.05	.41***^a	.53***	.35***			
Vocal Reactivity	4.12	.05	4.40	.05	4.64	.05	.55***	.53***	.40***			
High Pleasure	5.82	.04	6.10	.04	6.32	.04	.43***	.43***	.30***			
Smiling and Laughter	4.67	.05	4.74	.05	4.97	.05	.54***	.50***	.36***			
Activity Level	4.35	.05	4.09	.05	4.02	.06	.49***	.42***	.35***			
Perceptual Sensitivity	4.23	.06	4.26	.06	4.48	.06	.54***^b	.39***	.40***			
Negative Affect	3.55	.04	3.58	.03	3.47	.03	.62***	.57***	.48***			
Sadness	3.59	.06	3.30	.05	3.32	.05	.53***^c	.42***	.29***			
Distress to Limitations	3.91	.04	4.21	.04	4.05	.04	.59***	.53***	.40***			
Fear	3.56	.06	3.81	.06	3.61	.06	.50***	.56***	.43***			
Falling Reactivity	4.89	.06	4.97	.05	5.10	.05	.56***	.51***	.46***			
Orienting/Regulation	4.89	.03	4.94	.03	5.00	.03	.34***	.37***	.20**			
Low Pleasure	4.94	.06	5.08	.05	5.19	.06	.43***	.47***	.21***			
Cuddliness	5.60	.03	5.39	.03	5.37	.04	.50***	.53***	.25***			
Duration of Orienting	4.23	.06	4.52	.06	4.67	.06	.54***	.54***	.36***			
Soothability	4.84	.04	4.78	.04	4.76	.04	.34***^d	.48***	.33***			
Average							.50***	.49***	.35***			

Note. IBQ-R scale scores range from 1 to 7 (1 = *never*, 2 = *very rarely*, 3 = *less than half the time*, 4 = *about half the time*, 5 = *more than half the time*, 6 = *almost always*, 7 = *always*). Bolded coefficients are significantly different.

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Table 2

Stability across Time for the IBQ-R Factors and Scales by Sex and Birth Order

A. Sex	Stability					
	6-12 months		12-18 months		6-18 months	
	Girls	Boys	Girls	Boys	Girls	Boys
Surgency	.64 ***	.60 ***	.60 ***	.57 ***	.45 ***	.43 ***
Approach	.40 ***	.41 ***	.52 ***	.55 ***	.37 ***	.32 ***
Vocal Reactivity	.55 ***	.56 ***	.54 ***	.53 ***	.41 ***	.40 ***
High Pleasure	.43 ***	.42 ***	.48 ***	.37 ***	.31 **	.29 **
Smiling and Laughter	.50 ***	.57 ***	.53 ***	.46 ***	.36 ***	.36 ***
Activity Level	.40 ***	.56 ***	.32 ***	.49 ***	.32 **	.38 ***
Perceptual Sensitivity	.53 ***	.56 ***	.39 ***	.39 ***	.37 ***	.43 ***
Negative Affect	.65 ***	.61 ***	.58 ***	.57 ***	.46 ***	.49 ***
Sadness	.59 ***	.47 ***	.41 ***	.43 ***	.28 **	.30 **
Distress to Limitations	.60 ***	.58 ***	.45 ***	.59 ***	.38 **	.42 ***
Fear	.53 ***	.46 ***	.58 ***	.54 ***	.35 ***	.49 ***
Falling Reactivity	.53 ***	.61 ***	.52 ***	.50 ***	.46 ***	.46 ***
Orienting/Regulation	.34 ***	.34 ***	.33 **	.40 ***	.24 *	.16
Low Pleasure	.41 ***	.45 ***	.45 ***	.47 ***	.25 **	.15
Cuddliness	.48 ***	.52 ***	.52 ***	.55 ***	.21 *	.29 **
Duration of Orienting	.50 ***	.57 ***	.53 ***	.54 ***	.37 ***	.34 ***
Soothability	.33 ***	.35 **	.48 ***	.49 ***	.30 **	.39 **
Average	.49 ***	.51 ***	.48 ***	.49 ***	.34 ***	.36 ***

B. Birth Order	Stability					
	6-12 months		12-18 months		6-18 months	
	First	Later	First	Later	First	Later
Surgency	.65 ***	.60 ***	.61 ***	.57 ***	.48 ***	.41 ***
Approach	.41 ***	.38 **	.54 ***	.52 ***	.36 ***	.32 **
Vocal Reactivity	.64 *** ^a	.48 ***	.60 *** ^f	.43 ***	.49 ***	.31 ***
High Pleasure	.50 ***	.36 ***	.50 ***	.37 ***	.32 **	.29 **
Smiling and Laughter	.54 ***	.54 ***	.55 ***	.44 ***	.44 ***	.28 *
Activity Level	.47 ***	.50 ***	.37 ***	.45 ***	.36 ***	.34 ***

B. Birth Order	Stability					
	6-12 months		12-18 months		6-18 months	
	First	Later	First	Later	First	Later
Perceptual Sensitivity	.51 ***	.56 ***	.31 ***	.46 ***	.39 ***	.39 ***
Negative Affect	.73 ***^b	.51 ***	.58 ***	.56 ***	.55 ***	.41 ***
Sadness	.60 ***	.47 ***	.35 ***	.50 ***	.30 **	.30 *
Distress to Limitations	.64 ***	.54 ***	.52 ***	.56 ***	.44 ***	.36 ***
Fear	.59 ***^c	.39 ***	.60 ***	.54 ***	.49 ***	.36 ***
Falling Reactivity	.67 ***^d	.47 ***	.53 ***	.49 ***	.48 ***	.43 ***
Orienting/Regulation	.46 ***^e	.18	.45 ***	.27 ***	.30 ***^g	.08
Low Pleasure	.47 ***	.39 ***	.50 ***	.44 ***	.28 **	.12
Cuddliness	.54 ***	.45 ***	.58 ***	.47 ***	.36 ***^h	.14
Duration of Orienting	.56 ***	.50 ***	.55 ***	.51 ***	.42 ***	.27 **
Soothability	.34 ***	.34 **	.46 ***	.50 ***	.32 **	.35 **
Average	.54 ***	.45 ***	.50 ***	.48 ***	.39 ***	.31 ***

Note. Bolded coefficients are significantly different.

^a $z = 2.07, p = .039$.

^b $z = 3.22, p = .001$.

^c $z = 2.34, p = .019$.

^d $z = 2.64, p = .008$.

^e $z = 2.77, p = .006$.

^f $z = 2.05, p = .040$.

^g $z = 2.02, p = .044$.

^h $z = 2.07, p = .038$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.